

FLAT PRODUCTS Roll Plant	Period of Report: July 2003 to June 2004	<b>ACIDA</b>
Steckel Mill No. 2		
Report number: 040731.1-3.1	!!! Confidential / For internal use only !!!	

# Report

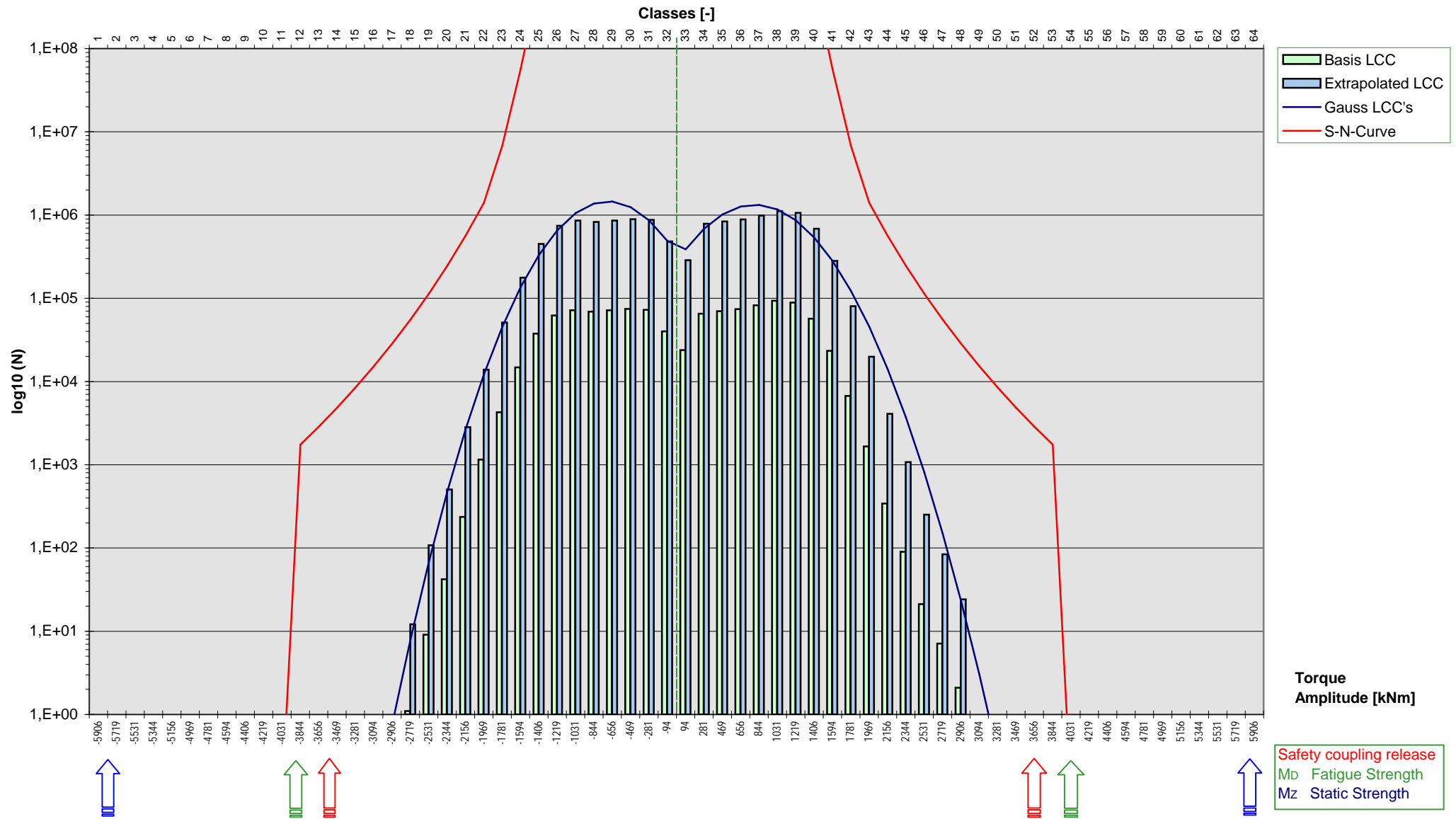
Residual Life-Time Calculation

Date: August 2004

Author: JM

- Requires your attention
- Information
- Verification / Approval
- Reply with comments
- .....

Approved by: \_\_\_\_\_ Date of Approval: \_\_\_\_\_ Copy to: \_\_\_\_\_



Definition of reference or measured LCC <sub>REF</sub>		
Number of classes		64
Measuring range [UNIT OF SIGNAL]		12000
Width of Class [UNIT OF SIGNAL]		187,5
Extrema	Minimum	Maximum
Classes	18,0	48,0
Amplitude	-2718,8	2906,3
M <sub>0, REF</sub> absolute Extrema LCC		2906,3
Class of the absolute extrema		48,0

Definition of the standardised normal distribution LCC <sub>GAUSS</sub>	left side (-)	right side (+)
Relative maximum	1,5000E+09	1,5000E+09
Sigma (width of distribution)	410	450
Offset (Max.position)	-700	800
Extrema	Minimum	Maximum
Classes	18,0	49,0
Amplitude	-2718,8	3093,8
M <sub>0, GAUSS</sub> absolute Extrema LCC		3093,8
Class of absolute extrema		49,0

Multiplier for extrapolated LCC <sub>EXTRA</sub>		
Reference or measuring period	[UNIT OF PERIOD]	1
Extrapolation period	[UNIT OF PERIOD]	12
Multiplier		12

Material properties for s-N-curve (Wöhler)	
Md Fatigue strength	1900,00
Nd number of load cycles for fatigue strength	2,00E+06
Mz static stress limit	4000,00
K <sub>ZEIT</sub> σ-N gradient at fatigue strength	10,00
K <sub>DAUER</sub> σ-N gradient at fatigue resistance (e.g. 2 K <sub>ZEIT</sub> - 1)	19,00

Results: Miner Rule modified by Haibach / Gatts	
<i>Fatigue level from incipient crack</i>	
> based on reference or measured LCC <sub>REF</sub>	0,651%
> based on extrapolated LCC <sub>EXTRA</sub>	7,812%
> based on standardised normal LCC <sub>GAUSS</sub>	13,335%
<i>Load cycles up to incipient crack</i>	
> based on reference or measured LCC <sub>REF</sub>	
N <sub>0, REF</sub> tolerable load cycles at max. amplitude M <sub>0, REF</sub>	28526
N <sub>REF</sub> estimated load cycles up to incipient crack	273201375
X <sub>REF</sub> estimated life cycles in reference periods	246,926
> based on extrapolated LCC <sub>EXTRA</sub>	
N <sub>0, EXTRA</sub> tolerable load cycles at max. amplitude M <sub>0, EXTRA</sub>	28526
N <sub>EXTRA</sub> estimated load cycles up to incipient crack	273201375
X <sub>EXTRA</sub> estimated life cycles in extrapolated periods	20,577
> based on standardised normal LCC <sub>GAUSS</sub>	
N <sub>0, GAUSS</sub> tolerable load cycles at max. amplitude M <sub>0, GAUSS</sub>	15265
N <sub>GAUSS</sub> estimated load cycles up to incipient crack	154513305
X <sub>GAUSS</sub> estimated life cycles in standardised periods	10,055

**Fatigue level**  
[0% = new / 100% = incipient crack]

**Expected life-time**  
[total years of use]